D.P.U. 94-8-CC (PHASE II)

Investigation by the Department of Public Utilities, on its own motion, into the monitoring and evaluation of Western Massachusetts Electric Company's demand-side management programs, including but not limited to: (1) the appropriateness of evaluation methodologies employed by the Company; (2) the application of evaluation results to the Company's incentives for 1991 and 1992 and to the fixed cost recovery adjustment for energy savings occurring in 1991 and 1992; (3) the implications of evaluation results for program design and future program monitoring and evaluation; and (4) the continuation of issues as set forth in D.P.U. 94-8A-CC (1994).

APPEARANCES: Stephen Klionsky
Senior Counsel
Western Massachusetts Electric Company
260 Franklin Street
21st Floor
Boston, MA 02110-3179
FOR: WESTERN MASSACHUSETTS ELECTRIC COMPANY
Petitioner

L. Scott Harshbarger, Attorney General
BY: Kevin McNeely
William M. McAvoy
Assistant Attorneys General
Regulated Industries Division
131 Tremont Street
Boston, MA 02111
Intervenor

Christine Constas Erickson, Esq.
Commonwealth of Massachusetts
Division of Energy Resources
100 Cambridge Street
Boston, MA 02202
FOR: DIVISION OF ENERGY RESOURCES
Intervenor

Jeanne M. Solé, Esq.
Robert H. Russell, Esq.
Conservation Law Foundation
62 Summer Street
Boston, MA 02210
FOR: CONSERVATION LAW FOUNDATION, INC.
Intervenor

Robert Sargent
Legislative Director
Massachusetts Public Interest Research Group
29 Temple Place
Boston, MA 02111-1305
FOR: MASSACHUSETTS PUBLIC
INTEREST RESEARCH GROUP
Intervenor

Andrew J. Newman, Esq.
Rubin and Rudman
50 Rowes Wharf
Boston, MA 02110
FOR: MONSANTO COMPANY, et al.
Intervenor

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I. INTRODUCTION

A. Scope of Proceedings

On August 23, 1993, October 5, 1993, and February 15, 1994, Western Massachusetts Electric Company ("Company" or "WMECo") filed reports detailing the monitoring and evaluation ("M&E") of the Company's demand-side management ("DSM") programs.

The Company filed impact evaluation reports[1] for the following programs: (1) the Customer Initiated Program ("CIP"); (2) the Energy Saver Lighting Rebate ("ESLR") Program; (3) the EnergyCHECK Program; (4) the Appliance Pick-Up ("APU") Program; (5) the Energy Conscious Construction ("ECC") Program; (6) the Energy Action Program ("EAP"); (7) the Single Family Electric Heat ("SFEH") Program; (8) the Domestic Hot Water ("DHW") Program; (9) the Lighting Catalog Program; (10) the Wrap-Up/Seal-Up Program; and (11) the Neighborhood Program. These reports are referred to collectively as the M&E Reports. In addition, the Company presented savings estimates for three programs (the Energy Crafted Home ("ECH") Program, the Multifamily Program, and the Public Housing Program), for which it did not file impact evaluations.

The M&E Reports are used in determining final estimates of energy savings resulting from installations during 1991. The M&E Reports also are the basis for the initial or first true-up of savings estimates from the 1992 installation period. The results of these evaluations are used by the Company and the Department for resource planning purposes, and to support recovery of lost

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[1] During the course of the proceedings, in response to information requests and record requests, the Company filed additional reports of impact evaluations.

base revenues[2] ("LBR") associated with DSM program delivery and financial incentives earned by the Company in 1991 and 1992. Table 1 summarizes the Company's 1991 and 1992 DSM activities. Table 2 summarizes claimed energy savings for 1991. Table 3 summarizes claimed energy savings for 1992. Tables 2 and 3 also summarize the Department's findings with respect to the Company's claimed savings.

In this Order, the Department determines whether the Company's annualized and lifetime savings estimates for measures installed[3] in 1991 and 1992 satisfy the criteria established by the Department. Because the LBR and incentive payments that the Company is entitled to recover are ultimately to be based on savings estimates that are approved by the Department, the Company will be required to recalculate the LBR and incentive components of the conservation charges ("CC") that are associated with the implementation of DSM programs during 1991 and 1992, to reflect the directives of this Order.

B. Procedural History

On February 17, 1994, the Department opened an investigation into the evaluation activities undertaken by the Company to estimate savings associated with DSM program implementation in 1991 and 1992, as well as to continue the investigation of the Company's CC

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2 Lost base revenues are those revenues that a company does not collect from its ratepayers because of the decrease in the billing units that result from DSM program savings. For Department purposes, LBR is synonymous with "fixed cost recovery adjustment" as it is used by the Company.

3 The Department may approve lifetime savings estimates for purposes of this proceeding. However, because lifetime savings estimates will change as new persistence data become available, approved lifetime savings estimates are subject to review and modification in future M&E proceedings before the Department.

rates for rate classes R-3 and G-2 begun in Western Massachusetts Electric Company, D.P.U. 94-8A-CC (1994) ("D.P.U. 94-8-CC"). The case was docketed as D.P.U. 94-8-CC. Pursuant to notice duly issued, a public hearing and a procedural conference were conducted in the Department's offices on March 28, 1994. The first phase ("Phase I") of this proceeding resulted in an Order issued on May 31, 1994 setting new CC rates for the R-3 and G-2 rate classes which took effect on June 1, 1994. The second Phase ("Phase II") of the proceeding consists of the Department's review of the Company's M&E Reports.

All parties to D.P.U. 94-8A-CC were made parties to the current proceeding.[4] No additional petitions for leave to intervene were filed. Phase II evidentiary hearings were conducted on May 18, May 19 and May 20, 1994. The Company sponsored the testimony of five witnesses: John Amalfi, manager of conservation programs; Stephen P. Waite, senior demand program planner; Michael Townsley, manager of demand planning; Peter Morante, manager of conservation and load management programs; and Dr. Marvin J. Horowitz, a consultant from Xenergy, Inc. CLF, MassPIRG and the Attorney General (collectively the non-utility parties ("NUPs")) sponsored the testimony of one witness: Dr. Kenneth M. Keating, an evaluation consultant for the NUPs.

The evidentiary record in Phase II includes Company responses to 260 information

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[4] The parties in the current proceeding include the Attorney General of the Commonwealth ("Attorney General"), the Commonwealth of Massachusetts Division of Energy Resources ("DOER"), the Massachusetts Public Interest Research Group ("MassPIRG"), the Conservation Law Foundation ("CLF"), and Monsanto Co. et al.

requests[5] and to 20 record requests, as well as 23 Company exhibits and two exhibits from CLF. In addition, the record from D.P.U. 94-8A-CC was incorporated into the record in this case.[6]

Both the Company and CLF filed briefs and reply briefs. The Attorney General sent the Department a letter supporting and adopting CLF's brief and reply brief. Finally, both the Company and CLF sent letters responding to each other's reply brief.

II. DESCRIPTION OF DSM SAVINGS ESTIMATION TECHNIQUES

The energy and capacity savings estimates produced by the impact evaluations are used by the Company and the Department for planning purposes and for determining the DSM incentive and LBR to be collected by the Company in a particular year. In order to serve these purposes, the impact evaluations must produce savings estimates that: (1) reflect the period of time over which the energy conservation measures ("ECMs") can be expected to generate savings (i.e., "lifetime" savings estimates); (2) reflect the level of demand savings that occurs at the time of, or coincident with, a company's peak power demand (i.e., "coincident" demand savings);[7] and (3) do not include the level of savings that would have occurred in the absence of implementation of the

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5 On May 16, 1994, the Company filed a motion for a Protective Order to prevent public disclosure of the Company's responses to two information requests, Exhibits DPU-5-4 and DPU-6-1. The Company did not provide sufficient information to allow the Department to make a determination whether the requested information should be protected. However, since there were no objections to the Company's motion, the Department will place such information in a sealed record and, if necessary, the Department will re-examine this issue in the future.

6 Exhibits from D.P.U. 94-8A-CC will be referred to as "Exh. 94-8A-CC".

7 Savings estimates that do not take into account the level of demand savings that occurs at the time of a company's peak power demand are referred to as "non-coincident" demand savings estimates.

DSM programs (i.e., "net" savings estimates).[8] To determine net savings estimates, gross savings estimates must be adjusted to take into account non-program factors that may affect the electricity consumption of program participants. These factors include free-ridership,[9] spillover,[10] economic conditions (both general and firm-specific),[11] weather and snap-back.[12] The ratio of the measured savings estimates to the engineering savings estimates is referred to as the "realization rate". In recent Orders, the Department has specified various methods by which energy and capacity savings estimates should be determined, including engineering estimates, billing analysis and end-

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8 Savings estimates that include the level of savings that would have occurred in the absence of implementation of the DSM programs are referred to as "gross" savings estimates.

9 A free rider is defined as a program participant who would have installed an ECM without direct payment from an electric company. Investigation into Pricing and Rate-making Treatment for Non-Qualifying Facilities, D.P.U. 86-36-F at 25-26 (1988). A pure free rider would have spent the same amount of money to install the same energy-efficient measures at the same time without benefit of a utility company's program. A partial free rider would have spent less money, installed less equipment, installed only somewhat efficient equipment, and/or installed the equipment at a later date.

10 Spillover is an effect of DSM programs whereby customers' purchases of energy-using technologies or behavioral patterns are altered, but those customers do not ask for a rebate from the electric company and are not considered "participants" in the company's DSM programs. Free drivers, customers whose installation of ECMs is attributable to a company's marketing of a DSM program but who do not participate in a utility-sponsored DSM program or receive payments from a utility, are considered to be a subset of spillover. Western Massachusetts Electric Company, D.P.U. 89-260, at 11-12 (1990).

11 Firm-specific economic conditions may include changes in floorspace, equipment, hours of operation, industrial process configuration, output, employment, and/or sales.

12 Snap-back is an effect where a customer responds to the lower cost of accomplishing a task after implementation of an ECM by increasing energy consumption. Consequently, some of the projected savings for a DSM program are lost as a result of increased use by participants after an ECM is installed.

use metering methodologies. See Massachusetts Electric Company, D.P.U. 92-217-B at 7-16 (1994) ("D.P.U. 92-217-B"); Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 94-2/3-CC at 9-18 (1994) ("D.P.U. 94-2/3-CC").

III. STANDARD OF REVIEW

The Department has established the criteria to be used in the review of electric companies' DSM impact evaluations through a series of previous orders. To ensure the reliability of the savings estimates produced by the impact evaluations, the Department has directed companies to minimize bias in the savings estimates. Boston Edison Company, D.P.U. 90-335, at 105 (1992) ("D.P.U. 90-335"); Western Massachusetts Electric Company, D.P.U. 91-44, at 140, 143 (1991) ("D.P.U. 91-44"). The Department has found substantial bias in engineering estimates of DSM savings and, accordingly, generally has required companies to measure savings after the installation of ECMs.[13] D.P.U. 90-335, at 106; Nantucket Electric Company, D.P.U. 91-106/138, at 212-215 (1991); Massachusetts Electric Company, D.P.U. 90-261, at 79, 80, 85 (1991) ("D.P.U. 90-261"); D.P.U. 91-44, at 142-143.

The Department has identified some sources of bias in savings estimates, including: (1) poor selection of samples used in savings measurement analyses, D.P.U. 91-44, at 138; (2) inaccurate hours-of-use estimates, D.P.U. 90-335, at 105; D.P.U. 91-44, at 142; D.P.U. 90-261, at 109-110; (3) the failure to account for free riders, D.P.U. 90-335, at 111-112; (4) the

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[13] The Department has allowed savings estimates which are not based on after-the-fact measurement for programs in which (1) only one well-defined end use is involved and the hours of operation of the installed ECMs are very predictable or controlled by a company, or (2) it can be demonstrated that no after-the-fact measurement is possible. D.P.U. 90-261, at 109; D.P.U. 90-335, at 109, n.40; D.P.U. 91-44, at 142.

failure to account for interactions of multiple DSM measure installations, Cambridge Electric Light Company/Commonwealth Electric Company, D.P.U. 89-242/246/247, at 78-79 (1990); and (5) overestimated persistence of savings. D.P.U. 90-335, at 110-111; D.P.U. 91-44, at 147-148.

The Department has recognized that, in certain instances, the costs of obtaining more precise estimates of savings may exceed the incremental value of those more precise estimates. D.P.U. 90-261, at 100. Therefore, the Department has directed companies to pursue savings measurement activities that maximize the level of precision of the DSM savings estimates, but only to the extent that the marginal value of the more precise savings estimates exceeds the marginal cost of obtaining the additional precision. D.P.U. 90-335, at 100-103, 110; D.P.U. 90-261, at 106, 108.

In future impact evaluation reviews, the Department will accept an electric company's savings estimates if the company demonstrates that the impact evaluations are reviewable, appropriate, and reliable. See D.P.U. 92-217-B at 6. A company's impact evaluation filing will be considered reviewable if the record is complete, clearly presented, and contains a summary that sufficiently explains all assumptions and data presented. Id. An impact evaluation will be considered appropriate if evaluation techniques selected are reasonable considering the characteristics of a particular DSM program, the company's resources, and the available methods for determining demand and energy savings estimates.[14] Id. Finally, the savings estimates included in an impact evaluation will be considered reliable if the estimates are sufficiently

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[14] The Department recognizes that the state-of-the-art in methods used to determine DSM savings estimates is evolving and expects companies to remain up to date with technological and methodological advances in this field.

unbiased and are measured to a sufficient level of precision, again, given consideration of the characteristics of a particular DSM program, the company's resources and the available methods for determining demand and energy savings estimates. Id. Interested parties will have the opportunity to comment on this standard of review in future proceedings.

However, for purposes of this proceeding (the first comprehensive, post-installation review of this Company's DSM impact evaluations), the Department will accept savings estimates if it can be determined that they are sufficiently unbiased and sufficiently precise, considering the nature of the program, the Company's resources, and the costs and value of obtaining better precision.

IV. THE COMPANY'S DSM IMPACT EVALUATIONS

A. Introduction

The Company submitted impact evaluations for most of the DSM programs that it implemented during 1991 and 1992 (see Exhs. WM-1 through WM-21; DPU-2-9, Bulk; DPU-2-128, Supp., Bulk; DPU-2-126, Bulk; DPU-RR-14, Supp., Bulk; DPU-RR-18, Supp.). Programs targeting the commercial and industrial ("C/I") sector include the EAP and the CIP, the EnergyCHECK Program, the ESLR Program, and the ECC Program (id.). Programs targeting the residential sector[15] include the SFEH Program, the APU Program, the DHW Program, the Multifamily Program, the Public Housing Program, the Lighting Catalog Program, and the Neighborhood Program (id.). Below, the Department reviews the impact evaluations for these

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[15] All of the Company's residential programs are part of the SPECTRUM Program.

programs.[16]

B. The Commercial/Industrial Sector

1. Energy Action Program

a. Introduction

The EAP is designed to address electrical efficiency opportunities at the facilities of the Company's largest commercial and industrial customers. The EAP provides engineering services and financial incentives to assist program participants in the identification and installation of comprehensive packages of ECMs. The end uses typically addressed through the EAP include lighting and heating, ventilating, and air-conditioning ("HVAC"), computerized energy management systems, motor drive systems, and other process-related measures (Exh. WM-11, at 1).

The Company conducted four different types of impact evaluation for participants in the EAP in 1991: (1) a billing analysis of grocery stores; (2) a billing analysis of schools; (3) on-site engineering assessments; and (4) site-specific billing analysis (Exh. WM-8, at i). In addition, the results of the on-site engineering assessments were extrapolated to 12 participants which, in the Company's view, could not be included directly in any of the four evaluations (Exh. WM-13, at 2). Because no WMECo customers were included in the site-specific billing analysis, that

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[16] Because WMECo and its affiliate, the Connecticut Light & Power Company ("CL&P"), are subsidiaries of Northeast Utilities ("NU"), DSM program implementation and evaluation are conducted for both companies by NU. The programs offered in both service territories are essentially identical. In this Order, all references to energy and capacity savings estimates will pertain to WMECo, unless specified otherwise.

evaluation will not be addressed in this Order. Each of the other evaluations, including the extrapolation analysis, is described below. Prior to conducting these analyses, the Company allocated program participants to each type of analysis based on factors such as the type and complexity of the ECMs installed, the magnitude of estimated savings relative to consumption, and the type of facility treated (Exh. DPU-2-71).

In 1991, a total of 89 customers participated in the EAP, of which 10 were in the WMECo service territory (Exh. WM-8, at i). The Company estimates annualized energy savings of 2,889 megawatthours ("MWH"), lifetime energy savings of 53,775 MWH, and capacity savings of 1,124 kilowatts ("KW") for these 10 projects (Exhs. DPU 5-22, Supp.; 94-8A-CC, WM-1, att. C at 3). The Company applied the realization rates resulting from its impact evaluation of 1991 participants to the tracking estimates[17] for the 21 WMECo customers participating in the EAP in 1992, in order to calculate a preliminary estimate of savings from 1992 program implementation (Exh. DPU 5-22, original and supplemental responses). This calculation resulted in an estimate of annualized savings of 8,921 MWH, lifetime savings of 141,774 MWH, and capacity savings of 2,269 KW for 1992 EAP implementation in the WMECo service territory (Exhs. DPU 5-22, Supp.; D.P.U. 94-8A-CC, WM-1, att. C at 3).

b. Billing Analysis of Grocery Stores

i. Description

The billing analysis of grocery stores assessed the energy savings due to participation in the program for a total of 19 grocery stores (all from the same chain)[18] participating in 1991, by

[17] Tracking estimates are the product of the original engineering estimates for each type of ECM multiplied by the number of each type installed during a program year.

means of a regression analysis of the monthly bills of program participants and those of a matched group of 122 non-participants (Exh. WM-9, at i).

NU performed billing analyses using two different regression models, and a technique called "weighted least squares" regression (id. at 9-10, 14). The first of these regression models attempted to predict the change in annualized energy consumption between the pre- and post-installation periods as a function of participation in the EAP and/or the ESLR program (id.). The Company stated that this model provided reasonable, direct estimates of the annual savings associated with the EAP, and that the model was improved by including engineering estimates of savings associated with participation in the EAP or ESLR program (id. at 10).

The second regression model included engineering estimates of savings from the EAP and ESLR programs, and took account of weather normalized, annualized consumption (id.). This model was successful in explaining a large fraction of the month-to-month variation in energy consumption (id. at 12-13). According to the Company, the weighted least squares regression yielded unbiased estimates of regression parameters and appropriate confidence intervals (Exh. WM-10, at 15). This technique resulted in a realization rate of 69.2 percent, with a relative precision of ± 25.1 percent at 90 percent confidence (Exh. WM-9, at 15).

A. Analysis and Findings

The record indicates that the Company used a regression analysis of the electric bills of all grocery stores participating in the program in 1991, with a comparison group of 122 non-participating groceries. The record demonstrates that the selected regression model is statistically

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[18] Only one of these stores was in the WMECo service territory (Exhs. DPU-5-22; WM-9, at 4).

predictive of energy savings among the participant group and that its results are consistent with alternate model specifications. The Department finds that the data screening and analysis procedures employed by the Company are sufficiently free from bias. The Department finds further that, by including data on non-participants, the selected model implicitly accounts for free-ridership. Based on its review of the record, the Department finds that the savings estimate for the grocery stores participating in EAP is sufficiently unbiased and precise. Accordingly, the Department accepts as final the annual and lifetime energy savings estimates determined by this evaluation for the single grocery store in the WMECo service territory that participated in the program in 1991. The Department also accepts the preliminary savings estimate for 1992.

c. Billing Analysis of Schools

i. Description

The billing analysis of schools assessed the energy savings of the program for a total of 27 schools (three of which are in the WMECo service area) participating in the EAP in 1991, by means of a weighted least squares regression analysis (Exh. WM-10, at i, 15-16). As in the billing analysis of grocery stores, energy savings for schools were determined by comparing the weather normalized, annualized consumption of participants to that of non-participants (id. at 5). Because installations in two schools occurred during the post-installation period established for the study, and two had incomplete billing data, only 23 schools were included in the final sample of program participants for this evaluation (id. at 3). The original sample of 105 non-participant schools was selected from the group of schools that had not yet participated or that had cancelled their participation (id. at 3). Six of these schools

were eliminated from the non-participant sample because of unusually large changes in consumption between the pre- and post-installation periods, or because the model used to calculate their normalized, annualized consumption was unable to explain sufficiently the month-to-month variation in their actual billing data (id. at 5).

As it had for the billing analysis of grocery stores, the Company conducted regression analyses using two different models to determine energy savings in the school sector (id. at 10-11). The model that included the effects of weather normalized, annualized consumption resulted in a realization rate for the EAP of 85.9 percent (id. at 19). At the 90 percent confidence level, the relative precision associated with this estimate was ± 23.3 percent (id.).

ii. Analysis and Findings

The record indicates that the Company used a regression analysis of the electric bills of all schools participating in the program in 1991 for which reliable data existed and a matched group of 99 non-participating schools to determine energy savings in the school sector. The record demonstrates that the selected regression model is statistically predictive of energy savings among the participant group and that its results are consistent with those of alternative models. The Department finds that the data screening and analysis procedures employed by NU are sufficiently free from bias. The Department finds further that by including data on non-participants, the selected model implicitly accounts for free-ridership. Based on its review of the record, the Department finds that the savings estimate for the schools participating in EAP is sufficiently unbiased and precise. Accordingly, the Department accepts as final the annual and lifetime energy

savings estimates determined by this evaluation for the three schools in the WMECo service territory that participated in the program in 1991. Further, the Department accepts the Company's preliminary savings estimates for 1992.

d. On-Site Engineering Analysis

i. Description

The Company conducted on-site engineering assessments ("OSEA") of energy savings for 21 customers (three of which are in the WMECo service territory) that participated in EAP in 1991 (Exhs. WM-11, at i; DPU 5-22, Supp.). These participants were selected for OSEA because a significant portion of their savings was due to efficiency improvements to industrial processes (which the Company indicated made it difficult or impossible to identify a comparison group) and because the ECMs installed at their facilities resulted in substantial savings (which the Company indicated made them inappropriate candidates for extrapolation analysis) (id. at 2). The original engineering estimates calculated as part of EAP delivery were compared to independent savings estimates developed as part of the OSEA, based on survey techniques specifically developed for each ECM, spot measurements, short-term end-use monitoring, and interviews with facility personnel to determine free-ridership (id. at 3).

The Company aggregated energy savings estimates resulting from the OSEA for lighting ECMs and for non-lighting ECMs, and compared these to the original engineering estimates of energy savings from the tracking system (id. at 9). The resulting gross realization rate was 86.9 percent for lighting ECMs, and 93.5 percent for non-lighting ECMs (id. at 9-10).

The Company then determined net energy savings by applying the results of the

free-ridership interviews. The free-ridership interviews indicated that none of the 1991 program participants would have installed lighting efficiency measures in the absence of the program (Exh. WM-11, at 16). The net realization rate for lighting ECMs therefore equaled the corresponding gross realization rate of 86.9 percent (id.). For non-lighting ECMs, however, free-ridership reduced savings by 12.4 percent, resulting in a net realization rate of 81.8 percent (id.). Because savings estimates were developed for each individual participant in the OSEA group, statistical precision for the net realization rate was not calculated.

ii. Analysis and Findings

The record indicates that the 1991 EAP participants included in the OSEA were unsuited for inclusion in a billing analysis of energy savings because of the unique nature of the ECMs installed in their facilities and the inherent difficulty of identifying a comparable non-participant group. Given this fact, the Department finds that the evaluation approach adopted by the Company is appropriate, and strikes a reasonable balance between the cost of evaluation and the precision of its results. The Department has reviewed the calculations of gross savings for the three WMECo participants included in the OSEA evaluation, and finds them to be sufficiently unbiased. In addition, for purposes of this review, the Department accepts the Company's determination that these participants were not free riders. Accordingly, the Department accepts as final the annual and lifetime net energy savings estimates for the 1991 EAP participants. The Department also accepts the Company's preliminary estimates of savings for 1992.

e. Extrapolation Analysis

i. Description

For 12 of the 1991 EAP participants (of which three were in the WMECo service territory), the Company concluded that direct evaluation of program impacts could not be conducted, and that the results of other analyses would therefore be extrapolated to determine the savings due to ECM installation at the sites of these participants (Exh. WM-13, at 2). The reasons stated by the Company for including a participant in the extrapolation group included: (1) concern about "excessive customer contact;"[19] (2) the customers did not fall into the school or grocery store category, and the magnitude of estimated savings did not warrant the OSEA approach; and (3) energy savings were likely to be very small compared to the customer's total energy consumption, and therefore, actual savings levels would not be revealed through a site-specific billing analysis (id.).

The Company determined that the participants included in the extrapolation group most closely matched the participants included in the OSEA evaluation (id. at 2-3; Exh. DPU-2-86). Therefore, in order to determine an estimate of gross savings, the extrapolation analysis simply applied the gross realization rates developed by the OSEA evaluation for lighting and non-lighting ECMs to the tracking estimates of savings for participants in the extrapolation group (id. at 5). Because the OSEA evaluation found no evidence of free-ridership for lighting ECMs, and because

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[19] The Company stated that five of the 1991 EAP participants had either just participated in another evaluation study or were engaged in sensitive negotiations with the Company regarding special rates, and that field management personnel requested that these customers not be contacted further (Exh. DPU-2-85). Agreement to participate in program evaluation became a condition of participation in the EAP in June 1993 (Exh. DPU-5-21).

the Company concluded that the specific types of non-lighting ECMs for which the OSEA analysis indicated free-ridership were not installed in the facilities of the extrapolation group, the Company made no free-ridership adjustment to the estimates of gross savings (i.e., the estimate of net savings equaled the estimate of gross savings) (Exh. DPU-2-90).

ii. Analysis and Findings

The Company stated that five participants were included in the extrapolation analysis, rather than being evaluated directly, because of concerns about excessive customer contact. While the Department accepts that there may be cases in which evaluation activities would be excessively invasive and upsetting to a customer, the Department observes that, given the substantial investments in energy efficiency in each participant's facility, such cases should be quite rare. The record shows that the Company now requires a customer's agreement to participate in impact evaluation as a precondition of program participation. For this reason, the Department anticipates that concerns of excessive customer contact should be minimal in the future.

Another justification the Company has offered for including participants in the extrapolation group is that the magnitude of anticipated savings for these participants did not warrant evaluation through the OSEA approach. The record indicates that the tracking estimates of savings for EAP participants in the extrapolation group range from 45 MWH to 1,509 MWH. However, the record also indicates that there are numerous participants for which an OSEA was conducted and for which the tracking estimate of savings was well below estimates for several members of the extrapolation group. For example, one project for which an OSEA was conducted had a tracking system estimate of only 24 MWH, substantially smaller than even the

smallest tracking estimate for the extrapolation group. This evidence undermines the credibility of the Company's contention that the level of energy savings for participants in the extrapolation group was too small to justify an on-site engineering assessment. Should the Company attempt to claim savings for an extrapolation group in the future, the Department will require it to provide substantial evidence in support of any contention that a given program participant could not be included in a more rigorous analysis of program impacts.

The record indicates that the Company did not conduct interviews to determine free-ridership among the participants in the extrapolation group. Further, the Company indicated that it did not adjust gross savings estimates for this group to account for free riders because (1) it found no evidence of free riders for lighting measures in the OSEA evaluation, and (2) the types of non-lighting measures for which the OSEA analysis indicated free-ridership were not installed in the facilities of members of the extrapolation group.

The record indicates that NU applied the gross non-lighting realization rate from the OSEA analysis to non-lighting ECMs in the extrapolation group, yet stated that it was inappropriate to apply a free-rider adjustment based on the same measures. The record further indicates that despite the fact that the Company's methodology identified only what the Company termed "unambiguous, pure free riders," the Company has found evidence of free-ridership in all EAP evaluations except in the billing analysis of grocery stores.[20] Based on the above, the Department finds it reasonable that the free-ridership levels determined for other EAP participants

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[20] It is important to note here that all groceries participating in the EAP in 1991 were from the same chain, and that free-ridership was determined through an interview with the single energy manager who has sole responsibility for all of the participating grocery stores.

be applied to the extrapolation group. The Department also finds that the Company's failure to adjust its estimate of gross savings to account for free riders subjects this estimate to upward bias. Accordingly, the Department directs the Company to revise its estimate of savings due to non-lighting ECMs to reflect the 12.4 percent free-ridership level found for non-lighting measures in the OSEA evaluation. The Department further directs the Company to revise its 1991 incentive and its estimates of lost revenues occurring in the years 1991 through 1994 due to EAP installations in 1991 to reflect this adjustment, and to submit these revisions in a compliance filing in accordance with the directives in Section V of this Order.

Finally, because the estimates of savings due to EAP installations in 1992 are based, in part, on the realization rates determined for EAP participants in 1991, the Department finds that an adjustment to the Company's estimate of savings from EAP implementation in 1992 is necessary. Accordingly, the Department directs the Company to revise its estimates of savings due to ECMs installed through the EAP in 1992, as well as the corresponding estimates of the Company's 1992 incentive and lost revenues occurring in the years 1992 through 1994 due to 1992 EAP installations, and to submit these revisions in a compliance filing in accordance with the directives in Section V of this Order.

2. Customer Initiated Program

a. Description

The CIP provides rebates to customers who propose and install energy efficiency improvements to their own facilities (Exh. WM-1, at 1.1). The program primarily targets custom ECMs that may be site-specific and applicable to only a small number of customers (id.). The

rebate offered by the Company covers as much of the cost of the efficiency improvement as necessary to ensure that the participant's investment is repaid by energy savings in one year (id.). Customers wishing to participate in the CIP must provide an abstract of a planned efficiency improvement and have it approved by NU. Then a full proposal and monitoring plan must be submitted and approved (id.).[21] Upon approval of the proposal by NU, the customer must implement a pre-installation monitoring program, have the measure(s) installed, perform post-installation monitoring, and submit a completion report to NU (id.). Upon approval of the completion report, a rebate is paid to the participant (id.).

The evaluation of the CIP projects completed in 1991 and 1992 consisted of four tasks. First, a review was conducted by an independent contractor of the program files maintained by the Company (id. at 3.1). Second, an on-site survey of participants was conducted to determine the ECMs installed, patterns of operation for the affected end uses, any changes in post-installation consumption, participant satisfaction with the program, and adjustments to gross savings estimates to account for free-ridership, free-drivership, and snapback (id. at 3.1-3.2). This task did not extend to the development of data found to be missing or deficient (Tr. 4, at 24, 34). Third, the contractor determined an estimate of gross savings based on any observed differences

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[21] Section 10.1 of the July 1991 CIP Implementation Manual states that:

> CIP participants are required to document the energy savings achieved in their project through self-monitoring. The monitoring is intended to generally include direct sub-metering of the impacted equipments, both before and after ECM installation .... The duration of monitoring must be long enough to ensure an accurate representation of the average energy used by the equipment before and after ECM installation.

(Exh. DPU-7-4).

between operating conditions reported in program documentation and those existing at the time of the site visit (Exh. WM-1, at 3.1-3.2). Finally, any necessary adjustments for free-ridership, free-drivership, or snapback were applied to determine an estimate of net energy savings for each project (id.). In response to an information request, the Company stated that it spent a total of $58,907 to evaluate 1991 and 1992 participants in the WMECo service territory (Exh. DPU-2-93). This amounts to 2.2 percent of the $2.7 million spent on WMECo participants in the CIP in 1991 and 1992 (Exh. 94-8A-CC, DPU-1-20).

The report of the evaluation contractor, while generally supportive of the monitoring conducted by CIP participants, indicated that for eight of the 31 projects completed in 1991 and 1992, either monitoring activities were inadequate, or documentation on those activities was inadequate or even non-existent (Exh. WM-1, at 4.6-4.9). In particular, the contractor found cases reflecting the following: monitoring plans which failed to adequately account for conditions that influence energy usage (e.g., weather); incomplete monitoring of conditions affecting energy use; inadequate reporting on monitoring activities that were apparently performed; absence of monitored data on pre-installation conditions; and, in two cases, complete absence of monitored data (id. at 4.10). These shortcomings prompted the evaluation contractor to make statements such as "[m]ore information should have been provided before this project was approved for payment," and "[t]his completion report should not have been approved for payment in its current form, without further clarification and/or information" (id.). The Company indicated that in May 1992, it adopted a set of recommended monitoring guidelines which it distributed to all CIP participants (Exhs. DPU-RR-9; DPU-2-95; Tr. 6, at 63-64). The Company testified that these

guidelines have helped it to improve the quality of monitored data provided by CIP participants (Tr. 6, at 63-64).

A total of 17 customers participated in the program in 1991, of which six were in the WMECo service territory (Exhs. WM-1, at 1.4; DPU-5-26). For 1991 WMECo participants, the Company estimated savings of 4,407 MWH and 1,039 KW annually and 83,673 MWH over the lives of the installed measures (Exhs. DPU-5-26; 94-8A-CC, WM-1, att. C at 3). In 1992, a total of 14 customers participated, of which five were in the WMECo service territory (Exh. DPU-5-26). For these five customers, WMECo estimated savings of 1,707 MWH and 559 KW annually, and 26,260 MWH over the lives of the installed measures (id.; Exh. 94-8A-CC, WM-1, att. C at 3).

b. Analysis and Findings

The record evidence demonstrates that, whereas the monitoring performed for most CIP projects permitted calculation of reasonably accurate energy savings estimates, monitoring for a substantial portion of the projects was inadequate. This inadequacy resulted either from the failure of the Company to require a CIP participant to comply with the approved monitoring plan, or from the fact that even where a participant complied with the approved monitoring plan, the plan itself was inadequate to develop accurate estimates of energy savings. The record indicates further that, for each of the eight cases in which monitoring was found to be deficient, the participation process commenced (and in most cases was completed) prior to the issuance of the more rigorous monitoring guidelines now used by the Company.

The record further demonstrates that, despite the fact that the average savings estimate for

CIP projects was substantially greater than that of the EAP projects for which on-site engineering assessment was performed, the evaluation of CIP projects was less rigorous than the evaluation methods employed for the EAP OSEA projects. Under the OSEA method, the contractor developed a field measurement plan for each project, whereas for CIP projects the contractor merely checked the evaluation conducted by the participant, noting where that evaluation was deficient, but not collecting any additional data necessary to correct deficiencies. The record demonstrates that expenditures for the evaluation of the CIP program were relatively small in comparison to total program expenditures in 1991 and 1992.

On the basis of the above record evidence, the Department finds that the Company was remiss in (1) approving the payment of rebates for some participants who had not complied with their approved monitoring plans, and (2) approving monitoring plans for some projects that did not account for factors which would clearly influence estimated energy savings. Nevertheless, the Department finds that it would not be cost-effective to require the Company to re-evaluate savings estimates for those projects for which monitoring was determined to be deficient. The Department finds further that the monitoring guidelines currently distributed to CIP participants are likely to greatly reduce or eliminate the occurrence of such deficiencies in the future. Accordingly, the Department will accept as final the Company's estimates of annual and lifetime net energy savings for the six 1991 CIP participants in its service territory. The Department also accepts the preliminary estimates of savings for the 1992 program implementation. However, the Department hereby puts the Company on notice that any future occurrences of inadequate monitoring on the part of participants in CIP, or failure to correct for such inadequacies on the

part of the Company, may result in disallowance of the recovery of program expenditures for such participants, as well as disallowance of the recovery of any associated incentive or lost revenue.

3. EnergyCHECK Program

a. Description

The EnergyCHECK Program is designed to provide small C/I customers, whose demand usage is less than 50 KW a month, with comprehensive assistance in making energy management decisions, installing energy-efficient measures (electric end uses only), and funding the installation of all appropriate, cost-effective efficiency measures at a level up to the level of the Company's avoided cost (Exh. DPU-RR-18, Supp., Bulk at 1).

Customers who qualify for the EnergyCHECK Program receive a detailed needs analysis survey which includes an evaluation of the facility's electric usage and recommendations for the installation of cost-effective electric ECMs, including multiple options for equipment replacement, and the energy savings potential for each replacement option (id.). All participants are subject to a post-retrofit inspection of installed measures prior to the processing of any rebates from the Company (id.).

End uses currently available through the EnergyCHECK Program include lighting and HVAC, domestic hot water, motors, refrigeration, and custom end uses (id.).[22] All measures are installed by independent contractors and are inspected by WMECo (id.). In 1991, a total of 163 installations were completed (Tr. 5, at 91).

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[22] The custom end-use category is designed to provide energy conservation measures that are not specifically addressed in any of the previously listed classifications (id.).

The Company did not perform an impact evaluation for this program for 1991 participants (id.). The Company stated that participant levels were very low and that the program had changed significantly throughout 1991 (id.). Consequently, the Company stated that an evaluation of 1991 participants would not yield accurate results (id. at 91, 94). In its brief, the Company further asserts that the NUPs agreed with the Company's decision not to pursue a study of 1991 participants until more information and resources were available (Company Brief at 17).

The Company argues that its program tracking system provides a reasonable method for determining program savings for 1991 participants (id.). Using this program tracking system, the Company estimated a realization rate of 100 percent for 1991 participants in the EnergyCHECK Program, resulting in annualized energy savings estimates of 1,375,700 kilowatthours ("KWH") and lifetime energy savings of 25,617 MWH for installations in 1991 (Exh. 94-8A-CC, WM-1, att. B at 23; Company Brief Table 1). Further, the Company estimates annualized energy savings of 3,991,800 KWH and lifetime energy savings of 73,590 MWH for installations in 1992 (Exh. 94-8A-CC, WM-1, att. B at 23, att. C at 4).

b. Analysis and Findings

The record shows that the Company did not perform an impact evaluation for the 1991 EnergyCHECK Program. The Company's rationale for not performing the impact evaluation was based, in part, on the low number of participants in this program. However, the Department notes that the Company was able to perform impact evaluations for EAP, which had 89 participants, and CIP, which had 17 participants. Thus, the Department concludes that the program participation levels in the EnergyCHECK Program were sufficient to develop an impact

evaluation.

The Company also argued that the program underwent significant change throughout 1991, and that these continual changes precluded an accurate evaluation. The Department concurs that major program changes during the evaluation period may make it more difficult to determine accurate savings estimates. The Department also notes that the NUPs agreed with the Company's decision not to perform an impact evaluation and that during the course of proceedings, the NUPs provided no input regarding the resulting savings estimates. Generally, the Department has found engineering estimates, rather than after-the fact measurement, appropriate to use only in the case of direct load control programs, where the Company controls the hours of operation and only one well-defined end use is involved, or where it can be demonstrated that no after-the-fact measurement is possible. D.P.U. 91-44, at 142; D.P.U. 90-335, at 109, n.40; D.P.U. 90-261, at 109. Because a billing analysis or a more detailed impact evaluation were not feasible to perform because of continual program changes, the Department will accept the use of tracking system estimates for savings associated with the implementation of the EnergyCHECK Program in 1991. The Department also accepts the Company's preliminary savings estimates for 1992 implementation. However, the Department expects the Company to provide documentation regarding the persistence of savings from measures installed in 1991, as well as in subsequent years of implementation, in future impact evaluations of this program.

4. Energy Saver Lighting Rebate Program

a. Description

The ESLR Program, in operation since 1986, provides financial incentives to C/I customers to install energy efficient lighting measures in their facilities (Exh. WM-2, at ii). Approximately 6,000 C/I customers participated in the ESLR program during the installation period covered by the impact evaluation (id. at 2-3).

The 1991 impact evaluation examined customers whose rebate payments were sent for processing between January 5, 1991 and December 3, 199l (id.). The Company performed a billing analysis which compared the annualized, weather and/or seasonally-adjusted electricity consumption for each program participant before and after the installation of ESLR energy efficiency measures (id.). To strengthen the analysis, the Company included a comparison group of non-participating customers (id.). The pre-installation period was from August 1989 through November 1990, and the post-installation period was from December 1991 through November 1992 (id.). To control for the heterogeneity of commercial and industrial customers, the program study groups were stratified according to energy-use levels, building types, and geographic location (Massachusetts or Connecticut) (id. at iii).

The Company completed telephone surveys of 1,406 participants and 1,494 non-participants and used this information to perform a multiple regression billing analysis in which the change in participant and non-participant energy use from pre- to post-installation periods is explained as a function of key variables such as changes in building square feet, number of employees, and investment in non-program related energy efficiency measures (id.).[23] The

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[23] A total of 11 variables were included in the final regression model. These were (1) change in building square feet, (2) change in full load hours, (3) change in full-time employees at building, (4) change in building vacancy rate, (5) change in conditioned space, (6) increase in activities that use electricity, (7) non-participants influenced by

Company indicated that free-ridership was implicitly controlled for in the estimate of net savings by the presence of a matching comparison group of nonparticipants (id. at 3-4).

The Company examined the sensitivity of participants to calendar quarters and seasons (id. at 2-9). Where weather-adjustment was called for, annual consumption in the pre- and post-installation periods for each customer was estimated for long-run heating and/or cooling hours per day (id.).

The Company estimated annualized energy savings of 27,003,600 KWH and lifetime energy savings of 475,703 MWH for 1991 installations (Exh. 94-8A-CC, WM-1, att. B at 22). The Company estimated annualized energy savings of 2,312,400 KWH and lifetime energy savings of 25,639 MWH for 1992 installations (id.; att. C at 4). For 1991 installations, the realization rate was estimated to be 69 percent, with relative precision of ± 7 percent at the 90 percent confidence interval (Exh. WM-2, at iv). The Company projected a realization rate of 90 percent for the 1992 ESLR program installations (Exh. 94-8-CC, WM-1, att. B at 5).

b. Analysis and Findings

The record indicates that the Company conducted a billing analysis to estimate net savings attributable to the 1991 ESLR program. The record further indicates that this analysis examined electricity usage of program participants and non-participants before and after the installation of ECMs. The Department has found previously that pre- and post-installation billing analyses of

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program awareness to independently install energy efficient lighting measures, (8) decrease in activities that use electricity, (9) participants influenced by program awareness to independently install energy efficient lighting measures, (10) whether an energy management system has been installed, and (11) actual program participation (Exh. WM-2, Table 4-3).

participants and control groups can provide accurate estimates of energy savings at modest expense, while controlling for free riders. See D.P.U. 94-2/3-CC at 30; D.P.U. 92-217-B at 11; D.P.U. 90-335, at 103; D.P.U. 90-261, at 103.

The record also indicates that the Company stratified the participant and comparison group according to levels of energy usage, building type, and location (Massachusetts or Connecticut). In D.P.U. 92-217-B, the Department noted that stratification of the participant and comparison groups is a technique that can aid in selecting a sample that is representative of the total population of program participants and in selecting a comparison group that will best reflect the savings that would have been achieved by the participants had ECMs not been installed through the program. The Department notes that the Company provided an analysis which includes 11 independent variables. The Department finds that the independent variables selected by the Company are appropriate and allow the Company to isolate the effects of program participation from other effects. Accordingly, the Department finds the billing analysis conducted by the Company to be appropriate and the Company's estimates of energy savings for this program to be sufficiently unbiased and precise. Therefore, the Department accepts the energy savings estimates for the 1991 ESLR Program.

The Company indicated that it has begun to collect data on 1992 installations and that it has incorporated this information into its estimates of savings resulting from 1992 installations. Further, the Department notes that these estimates are subject to revision based on future impact studies. Therefore, for purposes of this proceeding, the Department accepts the 1992 ESLR Program savings estimates. These estimates will be subject to review and reconciliation in the

Company's next M&E filing.

5. Energy Conscious Construction

a. Description

The ECC Program is designed to introduce energy conservation measures in the commercial and industrial new construction market. The program is divided into a Comprehensive Area, which focuses primarily on large buildings that are in the early stages of design, and a Prescriptive Area, which focuses on smaller, less complex buildings which are often far along in the design process (Exh. WM-6, at 1). In the Prescriptive Area, over 90 percent of the measures installed were lighting measures, because many of the new buildings in the Company's service territory were in the final stages of design or were already under construction (Tr. 6, at 20-21).

The Company conducted evaluations of both Comprehensive and Prescriptive Area installations. For both of these program areas, savings estimates were calculated by comparing the estimated energy consumption of the ECC building with the estimated energy consumption of a typical building built in the absence of the ECC program using baseline practices (id.). WMECo defines baseline practices according to the Massachusetts building code or according to the results of baseline surveys conducted by NU in Connecticut (id.; Exh. DPU-RR-14). With respect to Comprehensive Area installations, the Company submitted a report of a site visit and a telephone survey for one of the sites in WMECo's service territory (Exh. WM-17). The impact evaluation for this site assessed hours of use, free-ridership, and persistence of savings, and indicated a realization rate of over 100 percent (id. at 2, 3). The realization rate greater than 100 percent was

largely attributed to the installation of lower wattage lighting than had been anticipated originally (id.).

The impact evaluation of Prescriptive Area installations was performed in two parts. The first part of the evaluation consisted of on-site engineering assessments of sample participants that used data on ECM installations to produce estimates of electric energy and system peak demand savings for individual ECMs (Exh. WM-7, at ii, 8, 11). Data were collected using standard auditing practices and spot measurements (id. at 11-12). In addition, interactive effects between ECMs were assessed by the Company (id.). The estimates of savings from the site visits were then compared to pre-installation engineering estimates to determine a realization rate for the program (id. at ii, 45).

The second part of the impact evaluation of Prescriptive Area installations relied on telephone surveys. Telephone surveys were used to update the original engineering estimates for hours of lighting use and to determine an overall free-ridership level of 0.1 percent (Exhs. WM-6, at i, 6; DPU-2-37). Surveys were also used to assess the degree of measure retention and the impact of trends in business activity on savings from installed measures (Exh. WM-7, at 30). The survey did not assess spillover effects or snapback effects.

The impact evaluation revealed a realization rate of 83.7 percent for Prescriptive Area installations (Exh. WM-6, at i, 6). Overall, the Company determined that the ECC Program had a realization rate of 105 percent (Tr. 6, at 3). The Company's evaluation effort was designed to take a first look at interactive effects between installed ECMs; however, this information was not used in the final determination of the program savings estimates (Exh. WM-7, at vi).

In 1991, incentives were paid to customers in 26 projects, two in the Comprehensive Area (Exh. 94-8A-CC, att. B at 20; Tr. 6, at 5). The Company estimated annual savings of 3,859,600 KWH and lifetime energy savings of 75,270 MWH from 1991 ECC installations (Exh. 94-8A-CC, att. B at 20, att. C at 2). In 1992, incentives were paid to 44 projects (Exh. 94-8A-CC, att. B at 20). The Company did not modify its tracking system estimate of savings for 1992 ECC installations, since the savings from individual ECC installations in 1991 could not be used to predict savings from installations in 1992; and the Company estimated annual savings of 3,061,000 KWH, and lifetime savings of 61,647 MWH (Exh. DPU-2-3, at 3; Exh. 94-8A-CC, att. B at 20, att. C at 4).

b. Analysis and Findings

The record shows that in evaluating the ECC program, the Company sought to improve its estimates of hours of use, to assess free-ridership, and to determine persistence of savings in both the Comprehensive and Prescriptive Areas. The evaluation also sought to take a first look at interactive effects of ECMs in the Prescriptive Area. The Department finds that the Company's impact evaluation of this program is reasonable and addresses many of the sources of bias that the Department has previously identified. Accordingly, the Department finds the Company's estimates of energy savings for this program to be sufficiently unbiased and precise, and accepts the Company's final determination of savings for 1991 installations. The record shows that the savings estimates for 1992 were not directly affected by the savings estimates from 1991 installations; therefore the Department accepts the Company's tracking system estimates for 1992 installations. The record shows that baseline information was derived from a previous impact

evaluation and from the Massachusetts building code. The Department recognizes that the establishment of the baseline energy consumption in a new construction program has a significant impact on the estimated savings from installations in program. Therefore, the Department directs the Company to continue efforts to establish baseline energy consumption practices in new construction so that savings estimates are informed by actual baseline construction practices in Massachusetts.

C. The Residential Sector

1. Single Family Electric Heat Program

a. Description

The SFEH Program offers direct installation of lighting, building envelope, electric water heating, and appliance efficiency measures to electric heat residential customers living in one- to four-unit homes (Exh. WM-15, at ii). In 1991, measures were installed through the SFEH Program in 1,109 homes in the WMECo service territory (D.P.U. 94-8A-CC, Exh. WM-1, att. B at 11).

The Company proposes to use revised engineering estimates as the final estimate of savings from 1991 SFEH Program installations (Company Brief at 5). This savings estimate represents an overall decrease of 12 percent from the pre-installation energy savings estimates (id.). The revised engineering estimates incorporate revisions to estimated hot water savings based on impact research for DHW measures (id.; Exhs. DPU-2-122; DPU-6-1). The revised estimates reflect data gathered on retention rates, measure life and a free-rider estimate of 1.6 percent (Exh. DPU-2-122).

Estimated savings from DHW measures represent between one-quarter and one-third of the pre-installation savings estimates for the SFEH Program as a whole and are, on average, 30 percent lower than the pre-installation savings estimates for DHW measures (Exh. DPU-6-1). The remaining SFEH Program energy savings are due to installation of cooling, heating, lighting and refrigeration measures (id.). For these measures, the Company's proposed savings estimates incorporate the pre-installation engineering estimates without modification (id.). Preliminary estimates of savings from 1992 SFEH program installations were based on the program tracking estimates, with the same adjustments to the estimates of savings for DHW measures as were made in the proposed savings estimates for 1991 SFEH installations (Exh. DPU-2-125, at 1). The Company estimated annualized savings of 2,577,700 KWH, and lifetime savings of 54,004 MWH from installations in 1991 (D.P.U. 94-8A-CC, Exh. WM-1, att. B at 11, att. C at 2). In 1992, 1,043 homes were served through this program (id.). In its first look at installations from 1992, the Company estimated annualized savings of 2,297,800 KWH, and lifetime savings of 45,285 MWH (id.; att. C at 4).

In contrast, the Company presented an impact evaluation of the 1991 SFEH Program installations, which revealed savings per participant of 1,460 KWH, a decrease of 42 percent from the pre-installation savings estimate (Exhs. WM-15; DPU-2-9; Company Brief at 5). The Company declines to use the results of this impact evaluation, as discussed infra. The impact evaluation, performed by Xenergy Inc., used billing analysis to estimate the energy savings for 1991 program participants by comparing pre- and post-installation energy consumption[24]

[24] The author of the report indicated that billing analysis is widely used to estimate savings from DSM programs and that he has had extensive experience in performing billing

(Exhs. WM-15; DPU-2-9, Bulk). Xenergy originally did a billing analysis and subsequently performed a follow-up study in response to the Company's concerns that the savings estimates that derived from the original study were unexpectedly low. The purpose of the follow-up study was to explain the annual change in energy use of the nonparticipant customer sample that was used to evaluate the SFEH Program (Exh. DPU-2-9, Bulk at ii). The original billing analysis revealed annual energy savings of 1,243 KWH for each participant (Exh. WM-15, at iv). In the follow-up study Xenergy indicated that the gross decline in the energy consumption of non-participants could be attributed in large part to economic conditions(Exh. DPU-2-9, Bulk at ii). Xenergy stated that the original weather adjustment method was flawed and that net energy savings were 1,460 KWH rather than 1,243 KWH (Exh. DPU-2-9, Bulk at ii).

In order to account for non-program-related factors (such as the local economy and non-program-related conservation measure installation), the change in energy consumption for program participants was compared to the change in energy consumption for a group of non-participants (Exh. DPU-2-9, at 1-1). Free-ridership in the program was implicitly accounted for by having a comparison group of non-participants who would presumably be comparable to the participants in their installation of conservation measures absent the Company's DSM program (Tr. 4, at 64-66). To adjust for potential free-drivership, Xenergy incorporated a "general indicator" in its analysis to mitigate to some extent the effect of free-drivership, although this variable did not have much of an effect on the results of the analysis (id. at 66-82). The final impact evaluation report states that the samples of participants and nonparticipants appear to be

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analyses over the past ten years (Tr. 4, at 64; Tr. 5, at 139-140).

extremely well-matched (id.; Exhs. WM-15, at iv; DPU-2-9, at iii).

b. Positions of the Parties

i. The Conservation Law Foundation

CLF strongly disagrees with the Company's proposal that the billing analysis results be disregarded in favor of the significantly higher engineering estimates, and states that the results of the billing analysis should be used to calculate LBR and the Company's incentive (CLF Brief at 4). CLF argues that the M&E results of other programs demonstrate that, in general, engineering estimates were too high (CLF Reply Brief at 3). CLF states that the Company appears to have adjusted only the pre-installation savings estimates for DHW measures installed through the SFEH Program, and that it is not appropriate for the Company to receive credit for 100 percent of non-DHW savings estimates, which constitute the bulk of savings attributable to implementation of the SFEH program (id. at 4). CLF further contends that, despite the Company's claim that there is no explanation for the gross decline in annual energy use by WMECo customers, the billing analysis indicated that economic conditions could account for a significant portion of the decline in energy use (id. at 5). CLF argues that there is no support in the record for the Company's assertion that its engineering estimates are conservative (id. at 6). Finally, CLF dismisses WMECo's statement that billing analysis is in its infancy as "absurd" (id.). While CLF acknowledges that the analysis of free-drivership is in its infancy, CLF states that billing analysis is "a well-established, state-of-the-art method of deriving demand-side management program savings," and that free-drivership is unlikely to have significantly affected the SFEH program savings estimate (id.).

ii. The Company

The Company states that the tracking system estimates of energy savings, modified for DHW measure savings, should be considered the final estimate of savings for 1991 installations in the SFEH program, and that the results of the SFEH billing analysis should not be applied for the purposes of determining LBR and incentive recovery (Company Brief at 5). The Company presents a number of arguments supporting its rejection of the billing analysis results. The Company argues that, unlike billing analysis results which present an aggregate savings estimate, tracking system estimates can be corroborated, on a measure-specific basis, with empirical evidence (id. at 6). The Company states that the divergence between the tracking system estimates, which incorporate measure-specific data, and the billing analysis results warrants the rejection of the billing analysis (id. at 10).

Further, the Company argues: (1) that billing analysis is "very unstable and sometimes biased;" (2) that aggregate savings must be adjusted statistically to account for extraneous influences on aggregate consumption; (3) that billing analysis results do not provide much insight into the factors affecting program savings; (4) that it is not possible to have a "true" comparison group; (5) that the measurement of impacts of DSM through billing analysis is in its infancy; and (6) that there is a downward bias inherent in billing analysis (id. at 5-10). The Company also raises a concern with the existence of a "spillover effect," stating that the billing analysis produced evidence to suggest that there are spillover effects and that these effects have not been adequately incorporated in the billing analysis (id. at 8). In contrast, the Company argues that tracking system engineering estimates are preferable because they are based on measure-specific savings,

and that WMECo's engineering tracking estimates are conservative (id. at 6, 7). In addition, WMECo argues that it consistently estimates energy savings resulting from DSM programs using engineering and tracking data as well as billing analysis and seeking corroboration of savings estimates among the three methods (id. at 10).

Finally, the Company states that, as a general matter, it is interested in timely review and final determination of program savings in order to minimize uncertainty and financial risk; however, it argues that it be allowed to retain the option to petition the Department for reconsideration of final determination of savings should new information become available, particularly pertaining to free riders or free drivers (id. at 17-18).

c. Analysis and Findings

The Company has stated that the divergence between the tracking system estimates, which incorporate measure-specific data, and the billing analysis results warrants the rejection of the billing analysis. While the Department understands the importance of exercising judgment in applying the results of impact evaluation and recognizes that a Company must balance various sources of information in determining savings estimates, the Department finds that the Company has not made a convincing case for the rejection of the results of the billing analysis of the SFEH program. First, the Department finds that neither of the criteria for using savings estimates which are not based on after-the-fact measurement of savings is met in this case. The SFEH Program offers conservation measures for a number of end uses and the Company has not demonstrated that no after-the-fact measurement is possible. Further, the Department finds that a number of the Company's arguments regarding the short-comings of billing analysis are not valid. The

Company's claim that the comparison group of non-participants used in the billing analysis was not appropriate is contradicted by the record, which shows that the comparison group was well matched with the participant group and that the results were not particularly sensitive to small differences in participants' and non-participants' likelihood of participating in the program. Additionally, the Company's claim that billing analysis is in its infancy is clearly not supported by the record.

The Company contends that the discrepancy between the results of the billing analysis and the Company's tracking estimates justifies the rejection of the billing analysis results. While the Department supports the Company's efforts to refine the engineering estimates that are incorporated into the tracking system estimates of savings, the record shows that the Company's tracking system estimates incorporate revisions to only a portion of the measures installed under the SFEH Program. The Department finds that revising the engineering estimates for DHW measures, which represent only slightly above one-quarter of the savings in the SFEH Program, while assuming that 100 percent of the pre-installation engineering estimate of savings for non-DHW measures were realized, is not sufficiently unbiased and precise and is thus not appropriate for determining final savings estimates upon which both LBR and incentive calculations will be based. Clearly, billing analysis is not a perfect science and the results of billing analyses should not be blindly accepted. However, where reasonable efforts have been made to take into account those factors which could bias the results of the study, such as economic climate, weather, or propensity to participate, billing analysis provides an important tool for gauging the effectiveness of a DSM program in producing energy savings. Accordingly, the Department directs the

Company to revise its calculation of the LBR and the incentive to reflect savings of 1,460 KWH per customer, as determined by the billing analysis.

The Company states its concern that spillover effects are not adequately addressed in the billing analysis. The record shows that the determination of spillover effects is in its infancy and that there is an effort underway to develop methods for determining the extent of spillover effects. The record further shows that the impact evaluation was not sensitive to efforts to incorporate a preliminary assessment of spillover effects in the SFEH Program. Thus, the Department finds that the Company's efforts to discredit the results of the billing analysis because of suspected spillover effects are not well supported. The Department will revisit the issue of spillover effects in future proceedings when more information becomes available.

Finally, the Company has asked for the opportunity to revise its savings estimates as new data become available. The Department notes that there should be timely review and a final order addressing program savings for each installation year in order to avoid a lengthy period of uncertainty with respect to acceptable evaluation techniques and conservation charges. Therefore, the Department finds that final determinations of program savings for successive installation years should be made on a regular basis, and that, as a general matter, findings on program savings should not be open for reconsideration as additional information becomes available. New information should be incorporated into final savings estimates to the extent possible before a Department Order is issued, but it is the nature of M&E that the techniques and knowledge are constantly evolving and improving and it would be administratively infeasible to routinely revisit previously adjudicated final savings estimates.

2. Neighborhood Program

a. Description

The Neighborhood Program provides cost-effective electric conservation services to residential customers living in the urban areas of the Company's service territory (Exh. WM-21, at 1.1). Energy conservation measures are demonstrated and installed at no direct cost to the recipient, and residents are given information relative to the value of conservation retrofits (id.). Measures available under this program include compact fluorescent light bulbs, DHW tank wraps, DHW pipe insulation, DHW temperature turndowns, low-flow showerheads, faucet aerators, refrigeration brushings, and air conditioning measures (id. at 1.5). In 1991, a total of 4,576 installations were completed (id. at 2.1).

The Company estimated 1991 savings using engineering estimates adjusted by the results of customer surveys conducted in 1992 on participants in this program in both the 1991 and 1992 program years (id. at 5.1; Exh. DPU-2-125). The Company also conducted site visits at the homes of 29 participants who responded to the telephone survey to verify information that had been obtained during the telephone surveys on the average daily hours of use for the spring, summer, fall, and winter periods, coincident usage for the winter and summer peak, displaced wattage, snapback, and measure persistence (WM-21, at 1.9, 5.2). Lighting diaries were also completed by 26 of the 29 participants who were the subject of site visits, which resulted in usage data for 118 compact fluorescent light bulbs (id. at 5.2).

Factors to quantify free-ridership and free-drivership were developed from customer-reported data (id. at 1.9). Free-ridership estimates were 6.4 percent for compact fluorescent

bulbs, 0.8 percent for refrigerator brushing, 2.4 percent for faucet aerators, 2.1 percent for low-flow showerheads, and zero for all other measures, with an overall free-ridership rate of 2.8 percent (id. at 5.14).

To determine the level of free-drivership, the Company examined the ECM-purchasing patterns of participants prior to their participation in the program (id. at 5.15). The Company subtracted the pre-program purchase quantities of ECMs from the post-program purchase quantities of ECMs and compared the remainder to the total quantity of ECMs delivered to the participant population to derive an estimate of free-drivership (id.). The Company determined the following free-drivership rates for program participants: water heater temperature turndown, 20 percent; air conditioner filter cleaning, 13.3 percent; compact fluorescent lighting, 2.3 percent; and refrigerator coil cleaning, 2.3 percent (id. at 5.17).

The Company stated that the rate of measure persistence was assessed using data collected through a number of sources, including (1) customer-reported data obtained through the 1992 participant telephone survey; (2) verified data obtained during the site visits; and (3) customer-reported data obtained through the 1991 participant telephone survey (id. at 5.24). Measure persistence for installations during 1991 and 1992 was determined to be 91 percent and 97 percent, respectively (id.).

The Company estimated annualized energy savings of 2,373,700 KWH and lifetime energy savings of 15,052 MWH for installations in 1991 (Exh. 94-8A-CC, WM-1, att. B at 15). The Company estimated annualized energy savings of 1,767,300 KWH and lifetime energy savings of 14,055 MWH for 1992 (id., att. C at 4).

b. Analysis and Findings

The record indicates that the Company calculated the energy savings attributable to the 1991 and 1992 Neighborhood Program installations through an engineering analysis that was revised to incorporate the results of telephone and site surveys. The record also indicates that the Company conducted a series of comprehensive surveys using lighting loggers, diaries, site visits and telephone interviews to determine usage, free-ridership, free-drivership, snapback, and persistence. While there were differences in the results determined by each type of survey, these differences are small and the results generally support each other. In previous orders, the Department has accepted energy savings estimates based on this type of adjusted engineering analysis, rather than on a billing analysis, for programs where the expected savings from ECMs installed would be very small compared to participants' total energy use such that billing analysis would be unlikely to yield statistically valid results. D.P.U. 92-217-B, at 77-78. Therefore, the Department accepts the Company's use of adjusted engineering estimates to determine savings estimates for the Neighborhood Program. The Department finds that the savings estimates are sufficiently unbiased and precise. Accordingly, the Department accepts the annual and lifetime savings estimates for 1991 and 1992 installations under the Neighborhood Program as reported.

Regarding the use of telephone surveys and on-site visits to assess free-drivership (a component of spillover), the Department, for the purposes of this proceeding, will accept the Company's estimates of free-drivership for this program in this proceeding. However, the

Department notes that a consortium of electric companies has undertaken a study to determine the feasibility of assessing spillover effects. The Department will revisit this issue in future proceedings when more information becomes available.

3. Appliance Pick-Up Program

a. Description

The Appliance Pick-Up Program is designed to remove operating second refrigerator/freezers and freezers from the premises of residential customers throughout the Connecticut Light and Power Company and WMECo service territories (Exh. WM-5, at i). Approximately 2,619 appliances were removed under the program in 1991 (Exh. 94-8A-CC, WM-1, att. B at 18). This program will not be implemented after 1994 (Tr. 4, at 156).

The Company presented an impact evaluation of the Appliance Pick-Up Program (Exh. WM-5). The study used billing analysis and a multivariate regression model to estimate average annual energy savings from the removal of automatic defrost refrigerators, manual defrost refrigerators, and freezers (id. at iii). The billing analysis was performed using two comparison groups, one large group (3,565) of general use customers whose appliance holdings were unknown, and a smaller group (315) of non-participants who were known to have second refrigerators or freezers (id. at 9, 14). Free-ridership in the program was implicitly accounted for by having a comparison group of non-participants who would presumably be comparable to the participants in their installation of conservation measures absent the Company's DSM program (Tr. 4, at 64-66). The analysis made no modifications for the persistence of savings, but instead it incorporated the assumption that, when an appliance is removed, it will not be replaced within

what would have been its remaining useful life (id. at 158, 159). The analysis did not assess spillover effects (id.).

Using the smaller of the two comparison groups in the billing analysis, as recommended by the Company, results in annual energy savings estimates of 682 KWH for each frost-free refrigerator, 616 KWH for each manual refrigerator, and 623 KWH for each freezer, for a composite realization rate of 74 percent (Company Brief at 11). The Company estimated annual savings of 1,673,000 KWH, and lifetime energy savings of 14,622 MWH from appliances removed in 1991 (Exh. DPU-5-50; Company Brief, Table 1). In 1992, 2,440 appliances were removed through this program (Exh. 94-8A-CC, WM-1, att. B at 18). In its first look at removals from 1992, the Company estimated annualized savings of 1,421,700 KWH, and lifetime savings of 12,432 MWH (Exh. 94-8A-CC, WM-1, att. B at 18, att. C at 4).[25]

b. Positions of the Parties

i. The Conservation Law Foundation

CLF contends that the savings estimates for the Appliance Pick-Up Program should be based on the billing analysis that used the larger non-participant comparison group (CLF Brief at 4). CLF argues that the larger sample is more likely to be analogous to the participant group because some participants in WMECo's Appliance Pick-Up Program did not operate second appliances for the entire year before pick-up (id. at 5). CLF states that its assertion is borne out by the Company's subsequent modification of the program to avoid removing non-operating

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[25] Preliminary estimates of savings for 1992 removals are based on the savings of participants as revealed in the billing analysis of 1991 removals, without comparing the energy consumption of participants to the energy consumption of non-participants (Exh. DPU-2-125, at 2).

appliances (id.). CLF also argues that the results of the analysis using the smaller comparison group are counter-intuitive because the removal of a manual refrigerator appears to result in greater savings than does the removal of a frost-free refrigerator, whereas frost-free refrigerators could be expected to consume more energy (id. at 5, 6; CLF Reply Brief at 7-9). CLF maintains that the fact that the smaller comparison group's energy use increased over the study period is inconsistent with the fact that most customers in WMECo's service territory decreased their energy usage (CLF Brief at 8). CLF also maintains that this inconsistency calls into question the results of the billing analysis using the smaller comparison group (id.).

ii. The Company

The Company argues that savings estimates should be based on the billing analysis using the smaller comparison group (Company Brief at 11). The Company contends that use of the comparison group known to have second appliances is more appropriate than use of the larger comparison group, because it more closely matches the participants (id. at 11, 12).

c. Analysis and Findings

The Department has previously stated that poor selection of samples used in savings measurement analyses could be a source of bias in savings estimates. D.P.U. 91-44, at 138; D.P.U. 92-217-B at 5. In the present case, the Department finds that for the analysis of a conservation program designed to remove second appliances from residences, it is more appropriate to use a comparison group that is known to have second appliances, as was done in this case, than to use a comparison group whose appliance holdings are unknown. In addition, the record shows that the billing analysis incorporates free-ridership, economic climate and

weather adjustments. The Department finds that the Company's estimates of savings for the Appliance Pick-Up Program are sufficiently unbiased and precise. Therefore, the Department accepts the Company's final estimate of savings for 1991 removals. The Department also accepts the preliminary estimates of savings for 1992 removals.

3. Domestic Hot Water

a. Description

The DHW Program offers appliance maintenance and direct installation of various energy efficiency measures to non-electric heat customers at no direct cost to the customer (Exh. WM-18, at I-1). Appliance maintenance includes refrigerator coil cleaning, and cleaning or replacing air conditioner filters (id.). Efficiency measures include the installation of efficient lighting, hot water tank wraps, pipe insulation, faucet aerators, low flow showerheads, and thermostat turndowns (id.). Measures were installed in 7,940 homes in 1991, and in 5,722 homes in 1992 (Exh. 94-8A-CC, WM-1, att. B at 14).

The Company presented revised engineering estimates, which were agreed to by WMECo and participants in the Collaborative,[26] rather than billing analysis, as the final estimate of savings for 1991 DHW Program installations (id.; Exh. DPU-2-121). The revised engineering savings estimates proposed by the Company incorporate the results of several evaluation efforts (Exh. WM-18, at I-1, I-2; Exh. DPU-2-122). The estimated savings from DHW measure installations are based on program tracking information, surveys and site visits of 1991 DHW

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[26] The collaborative is a joint undertaking by the Company and the Non-Utility Parties to design comprehensive C&LM programs in a cooperative fashion. See D.P.U. 86-36-D (1988). The Collaborative includes the Attorney General, DOER, CLF, and the Massachusetts Public Interest Research Group.

installations, and the Measure Retention Study of the Company's Wrap-Up/Seal-Up Program[27] (Exh. DPU-2-122, at 2). Based on these evaluation efforts, the revised estimates reflect data gathered on persistence, measure life and a free-rider estimate (Exhs. DPU-2-122; Wm-18, at I-4; Tr. 6, at 39). The estimated savings from lighting measure installations are based on the evaluations of the Lighting Catalog Program and the Neighborhood Program that are reviewed elsewhere in this Order (Tr. 6, at 26). Preliminary savings estimates for 1992 program installations incorporate the same data as was used for 1991 program installations (Exh. DPU-2-125, at 2). The Company estimated annual savings of 4,661,400 KWH, and lifetime energy savings of 50,007 MWH for 1991 program installations (Exh. 94-8A-CC, WM-1, att. B at 14; Company Brief, Table 1). In its first look at installations from 1992, the Company estimated annualized savings of 2,660,600 KWH, and lifetime savings of 27,228 MWH (Exh. 94-8A-CC, WM-1, att. B at 14, att. C at 4).

While the Company submitted an impact evaluation that included a billing analysis of customers with electric water heaters, and determined a program realization rate of 17 percent, the Company rejected the results of the billing analysis (Exhs. DPU-2-121; WM-18, at I-5; DPU-2-122). The Company argues that results of the billing analysis were not meaningful and suggests that tracking system data and measure-specific data gathered through other evaluation efforts should be used to calculate revised savings (Company Brief at 16). The Company stated that the

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[27] The Wrap-Up/Seal-Up Program was a residential retrofit program implemented during the years 1981-1988 (Exh. WM-20, at ES-1). The Measure Retention Study was designed to provide statistically significant measure retention estimates, based upon actual field data, for DHW measures that were installed in several of the Company's residential conservation programs (id.).

billing analysis of the DHW Program produced results that were inconsistent with engineering calculations informed by site visit data and with other evaluation efforts of the Company that include site data collection and billing analysis (id.). For example, billing analysis savings estimates, which reflected savings from lighting measures as well as hot water measures, were less than savings for the lighting installations alone as determined in the evaluation of the Lighting Catalog Program[28] (Exh. DPU-2-121; Tr. 6, at 29). The Company states that, unlike in the DHW Program, the results of billing analysis in the Lighting Catalog Program were very close to the engineering estimates for the Lighting Catalog Program that included site measurements (Tr. 6, at 26). The Company thus believes the results of these other evaluation efforts to be more useful for estimating savings in the DHW Program than the results of the billing analysis in the DHW program itself (id.).

b. Analysis and Findings

The record shows that the results of the billing analysis for the DHW Program indicate an unusually low overall realization rate of 17 percent. The record also shows that the results of the billing analysis, which would reflect savings from lighting measures as well as DHW measures, are inconsistent with savings estimates for lighting measures installed under the Lighting Catalog Program. Elsewhere in this order, the Department accepts the Company's estimates of savings for the Lighting Catalog Program. Accordingly, the Department finds that it is not appropriate to base savings estimates for the DHW Program on the billing analysis of the DHW Program, which

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[28] The evaluation of lighting measure installation in both the Lighting Catalog Program and the Neighborhood Program included on-site measurement of hours of operation using site surveys and lighting loggers (Tr. 6, at 26-27).

shows savings for both lighting and DHW installations to be less than savings for lighting installations alone. The Department finds that the Company has made a reasonable effort in the DHW Program to base the estimated savings on evaluation of the measures installed under this program using information from other program evaluations.[29] Accordingly, the Department accepts the Company's savings estimate for the DHW Program for 1991. The Department also accepts the first look savings estimates for 1992.

4. Multifamily and Public Housing Programs

a. Description

These two programs provide direct installation of lighting, building envelope, electric water heating and appliance efficiency measures to multifamily and public housing customers (Exh. 94-8A-CC, WM-1, att. B at 12-13). In 1991, measures were installed in 476 multifamily units and in 653 public housing units (id.). In 1992, measures were installed in 1,631 multifamily units and 1,509 public housing units (id.).

The Company did not conduct separate impact evaluations of these programs because of the small number of customers and because the Company was unable to obtain an appropriate comparison group (Exh. DPU-2-125, at 2-3). Instead, the Company based energy savings on program tracking data adjusted for lighting retention rates determined in the evaluation of the Neighborhood Program and for the hot water savings estimated for measures installed in the DHW Program (id.). The Company indicated that 46 percent of savings in the Multifamily Program and 70 percent of savings in the Public Housing Program were estimated to derive from

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[29] This is unlike the SFEH program where the Company used empirical data to update savings estimates for only a portion of the measures installed under the program.

lighting and hot water measures (Exh. DPU-5-52).

The Company estimated annualized savings from installations in 1991 at 846,800 KWH in the Multifamily Program and 617,700 KWH in the Public Housing Program (Exh. 94-8A-CC, WM-1, att. B at 12-13). The Company estimated lifetime energy savings from 1991 installations of 17,707 MWH in the Multifamily Program and 10,914 MWH in the Public Housing Program (id., att. C at 2, 4). In its first look at savings from installations in 1992, the Company estimated annual savings of 2,775,600 KWH in the Multifamily Program and 1,804,200 KWH in the Public Housing Program (id.). The Company's preliminary estimates of lifetime energy savings from 1992 installations is 63,938 MWH in the Multifamily Program and 35,539 MWH in the Public Housing Program (id., att. C at 4).

b. Analysis and Findings

The Company stated that it was not possible to identify an appropriate comparison group for evaluation of the Multifamily and Public Housing Programs. In addition, the Company indicated that, through its incorporation of results from the Neighborhood and DHW evaluations, it partially accounted for free riders, hours of use and persistence of savings. The Department has accepted the final estimates of savings for 1991 installations in the Neighborhood and DHW programs. The record shows that lighting and hot water measures were projected to be responsible for close to 50 percent of the savings in the Multifamily Program and 70 percent of the savings in the Public Housing Program. Accordingly, the Department accepts the Company's final estimates of savings for 1991. The Department also accepts the Company's preliminary estimates of savings for 1992 installations as sufficiently unbiased and precise. However, the

practice of evaluating the savings for only a portion of the measures installed through a program will not be found acceptable in future M&E proceedings. This practice is particularly problematic in the Multifamily Program where lighting and water measures are estimated to account for less than 50 percent of savings. The Department directs the Company to perform more comprehensive evaluation of these programs in the future.

5. Lighting Catalog Program

a. Description

The Lighting Catalog Program introduces and promotes energy-efficient lighting technologies to NU's residential customers through a mail order catalog (Exh. WM-19, at II-1).[30] Through this program, customers may purchase energy efficient lighting products at reduced prices, with the Company subsidizing approximately two-thirds of the cost (id.). In 1991, 19,593 orders for lighting products were processed (id.).

The Company estimated savings based on a pre- and post-installation billing analysis that included 259 general use program participants and 275 randomly selected general use non-participants used as a comparison group (Exh. DPU-2-126, Bulk B at 3-1). The pre-installation period was from July 1, 1989 to June 30, 1990; the installation period was from January 1, 1991 through June 30, 1991; and the post-installation period was from January 1, 1992 through December 31, 1992 (id. at Table 1).

The Company stated that the selected regression equation for the billing analysis included

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30 The products offered include compact fluorescent bulbs ranging from 9-watt to 27-watt bulbs, hard wired fixtures, and lighting accessories such as harp adapters, socket extenders and motion sensors (Exh. WM-19, at II-1).

17 independent customer-specific variables and estimated average program-related annual energy savings for the Lighting Catalog Program in 1991 to be 392 KWH (Exh. DPU-2-126, Bulk B at 3-8). The Company estimated annualized energy savings of 947,700 KWH and lifetime energy savings of 17,526 MWH for installations in 1991 (Exh. 94-8A-CC, WM-1, att. B at 16; Company Brief Table 1). The relative precision of this estimate at the 90 percent confidence level is 68 percent (Exh. DPU-2-126, Bulk B at 3-8). The Company estimates annualized energy savings of 883,300 KWH and lifetime energy savings of 15,066 MWH for measures installed during 1992 (Exh. 94-8A-CC, WM-1, att. B at 16; att. C at 4).

b. Analysis and Findings

The record indicates that the Company performed a multiple regression billing analysis to estimate the impact of the 1991 Lighting Catalog Program. The Department finds that the selection of independent variables was appropriate and enabled the Company to account for non-program-related effects which might otherwise confound the savings estimates. The record also indicates that the Company adjusted savings estimates to account for weather-related changes. Accordingly, the Department finds that the estimates for 1991 savings are sufficiently unbiased and precise. The Department finds further that, by including data on non-participants, the selected model implicitly accounted for free-ridership. Accordingly, the Department accepts as final the 1991 savings estimates for the Lighting Catalog Program. The Department also accepts the Company's first look estimates for 1992 installations.

6. Energy Crafted Home Program

a. Description

The Energy Crafted Home Program is designed to reduce the energy consumption of new homes below the energy consumption of new homes built in compliance with the Massachusetts Building Code (Exh. 94-8A-CC, att. B at 19).

The Company's estimates of energy savings are based on program planning assumptions (Exh. DPU-2-125). The Company did not perform an impact evaluation for 1991 and 1992 installations because there was only one home built under the program in each year (id.; Exh. DPU-5-28). The Company estimated 5.5 MWH of savings in 1991 and 3.3 MWH of savings in 1992 (Exh. 94-8A-CC, att. B. at 19). The Company estimates lifetime energy savings of 155 MWH from the 1991 installation and 102 MWH from the 1992 installation (id., att. C at 2-4).

b. Analysis and Findings

The record shows that in 1991 and 1992 there were only two houses built under the Energy Crafted Home Program. The Company states that because of the low participation in the program, it did not conduct an impact evaluation of the program. The Department finds that the Company's decision not to conduct an impact evaluation under these circumstances is reasonable; for purposes of this proceeding the Department accepts the Company's estimate of savings for 1991 and first-look at savings for 1992.

D. Capacity Savings

Using its estimates of annual energy savings and available hourly load model data, WMECo calculated estimated peak load reductions for both the summer and winter periods

(Exh. D.P.U. 94-8A-CC, DPU-1-18). The Company then multiplied these estimates of savings at the customer level by a season-specific factor which increased the capacity savings estimates to reflect demand reductions at the generator level (i.e., to correct for line losses) (id.).

For all programs, the record demonstrates that the Company developed capacity savings estimates based on load shape data that were applied to the energy savings estimates produced by the impact evaluations discussed above. The Department has found previously that the use of load shape data, in combination with billing analysis, "is potentially much less expensive than large-scale end-use metering and is largely based on actual data." D.P.U. 91-44, at 145-146. The Department has also found that this methodology provides an adequate basis for estimating capacity savings. D.P.U. 90-335, at 108.

However, because the Department has directed the Company to revise its energy savings estimates for EAP participants in the extrapolation group and for the SFEH Program, the Department finds that the Company must also revise its estimate of capacity savings from 1991 and 1992 implementation of both of these programs. Accordingly, the Department directs the Company to file a revision to its estimate of capacity savings due to installations in the EAP and SFEH Programs in 1991 and 1992, corresponding to the revisions required in Sections IV.B.1.e and IV.C.1.c, above. The Department further directs the Company to file a revision to its 1991 and 1992 incentives and LBR in accordance with its revised estimate of capacity savings.

E. Presentation of Results

The Department has stated that future impact evaluations must be reviewable, appropriate, and reliable. D.P.U. 92-217-B at 6. Specifically, the Department determined that "a company's

impact evaluation filing will be considered reviewable if the record is complete, clearly presented, and contains a summary that sufficiently explains all assumptions and data presented." Id.

In this instance, the Company presented impact evaluation reports to the Department in August 1993, October 1993, and February 1994. Additional impact evaluations were presented as responses to information requests from the Department (Exhs. DPU-2-9, Bulk; DPU-2-126, Bulk). For a number of programs, the Company's estimates of savings could not be deduced from the reports that were presented to the Department, but were a matter of Company judgment that was explained only in response to the Department's information requests and to questioning during hearings[31] (Exhs. DPU-2-4; DPU-2-9; DPU-2-121; DPU-2-126; Tr. 4, at 26).

The Department notes that, while extensive information was filed with the Department, the record was neither complete nor clearly presented and the reports were not accompanied by a summary that explained all assumptions and data presented. The Company also failed to make a clear and well-supported presentation of its savings estimates and of the sources of data and evaluation that contributed to those savings estimates. The Department acknowledges the importance of a company's judgment in reviewing and interpreting the results of its impact evaluations, and recognizes that a company may not always take its savings estimates directly from a particular impact evaluation report. However, the Department finds that it is equally important for a company to make a clear presentation to the Department of the company's

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[31] Programs for which estimates of savings could not be deduced from an impact evaluation report submitted to the Department included the SFEH Program, the DHW program, the Lighting Catalog Program, and the Appliance Pick-Up Program. The savings estimates for these programs were discussed briefly in the Company's filing in D.P.U. 92-88-A, but the Company stated that the estimates were preliminary or incomplete for all but the DHW program (Exh. WM-1, att. B, at 3).

interpretation and use of the results of its evaluation efforts. This is particularly critical in instances where a company supports savings estimates that do not derive directly from an impact evaluation report. The Department puts WMECo on notice that future impact evaluation filings will be reviewed only if the record is complete, clearly presented and contains a summary that sufficiently explains all assumptions and data presented.

V. ORDER

Accordingly, after due notice, hearing and consideration, it is

ORDERED: That the savings estimates from 1991 and 1992 DSM installations for which Western Massachusetts Electric Company has requested approval are approved in part and denied in part, as set forth above; and it is

FURTHER ORDERED: That the Company shall file a compliance filing in accordance with the directives set forth in this Order. The compliance filing shall contain recalculations of the Company's 1991 and 1992 incentive amounts and lost base revenues where the Department has directed recalculation as well as recalculations of the CC rates resulting from these changes, and shall be filed within seven days after the date of this Order (the Company is invited to comment on the appropriateness of changing CC rates at this time, based on the degree of change to the rates). The Company shall include in its compliance filing tables similar in format to Tables 1 through 3 in this Order, based on its recalculations; and it is

FURTHER ORDERED: That the Company shall follow any and all other directives contained herein.

By Order of the Department,

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Kenneth Gordon, Chairman

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Barbara Kates-Garnick,Commissioner

TABLE 1. SUMMARY OF 1991 AND 1992 DSM ACTIVITIES

	1991	1992
Total DSM Expenditures	$16.8 million	$14.3 million
Claimed Annual Energy Savings	52,980 MWH	34,320 MWH
Energy Savings as Percent of Sales	1.5 %	1.0 %
Claimed Annual Capacity Savings	13.6 MW	11.2 MW
Capacity Savings as Percent of Peak Demand	1.4 %	1.2 %
Claimed Lifetime Energy Savings	908,812 MWH	578,538 MWH
DSM Expense as Percent of Total Revenue	4.4 %	3.7 %
DSM Incentive as Percent of Net DSM Value	3.0 %	6.3 %
DSM Incentive as Percent of Total Revenue	0.3 %	0.2 %
Cost of Conserved Energy	2.2 ¢/KWH	3.0 ¢/KWH

(Company Brief, Table 1; Exh. DPU-2-1; Exh. 94-8A-CC, WM-1 (att. C))

TABLE 2. 1991 CLAIMED ENERGY SAVINGS

	Annualized MWH Claimed by WMECo	Actual MWH Claimed by WMECo	Annual KW Claimed by WMECo	Accepted by DPU?
Energy Action Program	2,889	3,175	1,124	No
Customer Initiated Program	4,407	3,125	1,039	Yes
Energy Conscious Construction	3,860	1,715	905	Yes
Energy Saver Lighting Rebate	27,004	26,318	4,881	Yes
Expanded Energy Check	1,358	1,789	319	Yes
Medium Energy Check	0	0	0	
C/I Total	39,518	36,092	8,268	
Single Family Electric Heat	2,577	1,596	1,357	No
Multifamily	847	1,116	404	Yes
Public Housing	618	176	305	Yes
Domestic Hot Water	4,661	3,967	1,377	Yes
Neighborhood	2,373	672	1,022	Yes
Lighting Catalog	948	571	479	Yes
Appliance Pickup*	1,438*	824	244*	Yes
Energy Crafted Home	6	0	3	Yes
Residential Total	13,462	8,807	5,191	
TOTAL	52,980	44,899	13,459	

Source: (Exh. 94-8A-CC, WM-1 (att. B at 11-31, att. B Table 2, att. C at 3))
* Savings estimates filed in DPU 94-8A-CC do not reflect Company's final savings estimates.

TABLE 3. 1992 CLAIMED ENERGY SAVINGS

	Annualized MWH Claimed by WMECo	Actual MWH Claimed by WMECo	Annual KW Claimed by WMECo	Accepted by DPU?
Energy Action Program	8,922	4,553	2,269	No
Customer Initiated Program	1,707	4,149	559	Yes
Energy Conscious Construction	3,061	4,511	725	Yes
Energy Saver Lighting Rebate	2,312	24,012	503	Yes
Expanded Energy Check	3,992	2,368	895	Yes
Medium Energy Check	715	4	161	Yes
C/I Total	20,709	39,597	5,112	
Residential Electric Heat	2,298	3,852	1,230	No
Multifamily	2,776	1,591	1,374	Yes
Public Housing	1,804	983	901	Yes
Domestic Hot Water	2,661	5,524	862	Yes
Neighborhood	1,767	3,666	775	Yes
Lighting Catalog	883	1,212	447	Yes
Appliance Pickup*	1,422	1,678	241	Yes
Energy Crafted Homes	3*	5*	2*	Yes
Residential Total	13,611	18,506	10,944	
TOTAL	34,320	58,103	16,056	

Source: (Exh. 94-8A-CC, WM-1 (att. B at 11-31, att. B Table 3, att. C at 5))
* Savings estimates filed in DPU 94-8A-CC do not reflect Company's final savings estimates.

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 1971).